

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



In re Application of:

C. David Chan

Application No.:

Batch No.:

Filed:

For: Method and Apparatus for Recording Incidents

Notice of Allowance Date:

Group Art Unit:

Examiner:

Class-Subclass:



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JUL 7 1999

GROUP 3600

PATENT APPLICATION TRANSMITTAL LETTER

Assistant Commissioner for Patents
Washington, District of Columbia 20231

Dear Sir/Madam,

Please file the following enclosed patent application papers of:

Applicant, Name: C. David Chan

Title of Invention: Method and Apparatus for Recording Incidents

- ☒ Specification, Claims and Abstract; No. of Sheets: 15 14^{cdc}
- ☒ Drawing(s); No. of Sheets: 3
- ☒ Information Disclosure Statement and Form
- ☒ Declaration Date Signed: July 7, 1999
- ☒ Statement for "Petition to Make Special"

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☒ Statement Claiming Small Entity Status -- Independent Inventor (PTO/SB/09)

☒ Check for \$395 made payable to Assistant Commissioner of Patents &
Trademarks to cover filing fee as an individual inventor as defined in 3.7 CFR
1.9(c). (Two independent claims and 20 claims. \$395)

☒ Check for \$130 made payable to Assistant Commissioner of Patents &
Trademarks to cover filing fee for "Petition to Make Special".

Respectfully,



C. David Chan

Date:

July 7, 1999

12779 Fair Briar Lane
Fairfax, VA 22033
(703) 322-1705

APPLICANT

**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR**

Docket Number (Optional)

Applicant, Patentee, or Identifier: CHUK DAVID CHAN

Application or Patent No.: _____

Filed or Issued: _____

Title: Method And Apparatus For Recording # Incidents

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- ☒ the specification filed herewith with title as listed above.
☒ the application identified above.
☐ the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ No such person, concern, or organization exists.
☐ Each such person, concern, or organization is listed below.

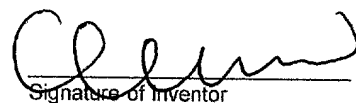
Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

CHUK DAVID CHAN
NAME OF INVENTOR

NAME OF INVENTOR

NAME OF INVENTOR


Signature of inventor

Signature of inventor

Signature of inventor

July 7, 1999
Date

Date

Date

UNITED STATES PATENT APPLICATION

TITLE:

Method and Apparatus for Recording Incidents

INVENTOR:

C. David Chan
Citizen of the United States
715 Paris Drive
Lawrenceville, Georgia 30243

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Method and Apparatus for Recording Incidents

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BACKGROUND OF THE INVENTION

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1. FIELD OF THE INVENTION

This invention generally relates to the field of navigation and recording apparatus. More particularly, this invention relates to digital imaging and audio apparatus used for recording events before, during and after an incident pertaining to a land, sea or air based transportation system.

2. BACKGROUND OF INVENTION

Every few minutes around the country and the world, there is an accident involving a land, sea or air based transportation system. In some cases, there are no survivors or eye-witnesses to give an account of what happened. Even with eye-witnesses or survivors, there are often disputes of the different accounts of what actually happened. As a result, millions of dollars are wasted in lengthy investigations and litigation leading to higher insurance premiums for society. Moreover, unable to accurately determine the cause of an accident, lessons are not learned to prevent future reoccurrence of similar tragedies.

For many years, 'black box' apparatus using audio and electro-mechanical recording means have been deployed on aircraft to provide investigators important clues of what may have occurred before a plane crash. Likewise, 'black box' apparatus using electro-mechanical means can be found near the engines of some land vehicles which record the speed and operator performance data that allows investigators to recreate a profile of what has occurred based on such physical data. However, one of the most valuable forms of evidence, a visual recording of the actual scene within the vicinity of the subject, are often unavailable.

In theory, one can use a security camera or a camcorder to capture the visual scene of an entire trip. In practice, these kinds of recording systems are only suitable for law enforcement purposes as in a police car or inside a building. This is because in the case of law enforcement and security applications, every minute of what has occurred

1 can be crucial in an investigation. In such applications, there is no way to automatically
2 determine what is important and to just record the portion of the scenario and to skip the
3 rest. However, in the case of accident or incident recording, the general pattern is that
4 only the last few minutes of the record prior to, during and after the accident contain
5 useful information. While capturing a few pictures after an accident has occurred is
6 insufficient and too late, to record scenes of an entire trip is not cost effective and is
7 wasteful because it requires a lot of storage media.

8 Prior art provided by US 5,596,382 and US 5,568,211 as well as US 5,262,813
9 disclose of mechanical apparatus able to capture, via a mechanical camera, a road scene
10 upon impact activated by mechanical trigger mechanisms during a car accident.
11 However, these systems relied solely on rigid mechanical capturing means with limited
12 storage capabilities and are not very flexible in the manner they operate and thus cannot
13 be used conveniently to provide the maximum benefit. These prior inventions focused
14 primarily on trigger mechanisms using mechanical means for land vehicles upon impact.

15 US 5,899,956 disclosed a digital navigation system capable of recording accident
16 scene for land vehicles. Despite of the fact that the disclosed invention incorporated a
17 mechanism which satisfies the need to automatically capture and preserve the accident
18 scene moments prior to, during and after the occurrence of an accident, it is designed
19 primarily to be used inside a land-based vehicle. What is needed is an apparatus with a
20 narrowed functionality suitable to be used inside a land, sea and air transportation
21 system. In addition, such an apparatus should be able to be used as an external device for
22 monitoring moving transportation systems and to record an incident when it occurs.
23 Examples of such external usage outside of a moving vehicle include roadway
24 intersections, rail-road crossings, underground subway stations. Such an improvement
25 through simplification and generalization is necessary in order to reduce manufacturing
26 cost by allowing the same apparatus to be used in multiple environments for a wider
27 population of the public in the society.

28 Furthermore, many documented cases of accidents are caused by operators not
29 being alert or awake while operating the vehicles. Therefore, in addition to having
30 forward-looking capability in an accident recording apparatus, it is beneficially to

1 provide a backward-looking capability to capture the activities of the operator and the
2 side and back view of an accident scene.

3 As a modern society that values human lives, the need to be able to have
4 available visual presentation for safety engineers in preventing future accidents of similar
5 nature has long been called for. Given the increasing high cost of incident investigation,
6 liability and litigation, the ability to establish cause, and place fault with viable evidence
7 is becoming more urgent. What is desperately needed in the society is an incident
8 recording apparatus that can be manufactured in a cost effective manner capable of
9 capturing and preserving the actual evidence prior to, during and after an incident
10 regardless of whether a passenger is riding in a land, sea or air based transportation
11 system.

SUMMARY OF THE INVENTION

The present invention is generally directed to satisfying the needs set forth above.

One objective of the invention is to capture the visual scene of an incident so many seconds before, during and after the incident has occurred involving a land vehicle to include a passenger car, bus, van, truck and train.

Another objective of the invention is to capture the visual scene of an incident so many seconds before, during and after the incident has occurred involving a sea-based vehicle to include a speed-boat.

Another objective of the invention is to capture the visual scene of an incident so many seconds before, during and after the incident has occurred involving an air-based transportation system such as a passenger jet.

Another objective of the invention is to capture the activities of the operator of a transportation system so many seconds before, during and after an incident has occurred.

Yet another objective of the invention is to capture the sound wave of an incident so many seconds before, during and after the incident has occurred as a supplement to the visual evidence.

Yet another objective of the invention is to allow the same apparatus to be used as an external monitoring device for recording incidents of moving subjects.

Yet another objective of the invention is to allow the same apparatus to be used as a hand-held device for recording incidents.

Yet another objective of the invention is to reduce the manufacturing cost by allowing the same apparatus to be used in multiple environments for applications having similar patterns.

In accordance with one preferred embodiment of the present invention, the foregoing need can be satisfied by providing a digital incident recording apparatus, comprising: a control unit, 10, for operating the apparatus; a memory unit, 20, for holding computer executable instructions; a persistent memory unit, 30, for providing persistent storage; an imaging capturing unit, 40, for capturing visual scene; a digital sensor, 50, for triggering an automatic preservation of captured scenes, an optional digital audio

1 recorder, 60, for capturing surrounding sound wave to sync up with the recorded images,
2 a power source, 70, to allow for continued operation and, 80, a protective housing.

3 Other objects and advantages of this invention will become readily apparent as
4 the invention is better understood by reference to the accompanying drawings and the
5 detailed description that follows.

100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic block diagram showing the essential components of one embodiment of the present invention.

FIG. 2 is a schematic block diagram showing in more detail the essential components of one embodiment of the present invention.

FIG. 3 is a schematic block diagram showing one preferred embodiment of how to preserve a fixed number of images using a finite storage for an unlimited period of time.

FIG. 4 is a schematic block diagram showing another preferred embodiment of how to preserve a fixed number of images using a finite storage for an unlimited period of time.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein are shown preferred embodiments and wherein like reference numerals designate like elements throughout, there is shown in FIG. 1 a schematic block diagram showing the essential components of one embodiment in accordance with the present invention.

As shown in FIG. 1, the digital system comprises: a control unit, 10, for operating the system; a memory unit, 20, for temporarily storage; a forward-looking image capturing unit, 40a, for capturing front view scenes; a backward looking image capturing unit, 40b, for capturing the rear and side view as well as the activities of the operator, 90; a digital sound recorder, 60, for capturing the surrounding sound wave to sync up with the recorded images captured by the imaging unit, 40; a persistent storage, 30, for providing persistent storage of the images captured by the image capturing unit, 40, and sound wave captured by the sound recorder, 60; a power source, 70, to supply the power to allow for continuing operation and a protective housing, 80, to protect the overall construction of the system.

FIG. 2 is a schematic block diagram showing in more detail the essential components of one embodiment of the present invention. It is seen to comprise: an image capturing unit, 40, which can be a CCD or CMOS device; a memory unit 20; a persistent storage 30; a digital sensor, 50, for sensing external events as to trigger the termination of capturing process of images and audio so as to preserve the data in the persistent storage, 30 and a sound recorder, 60 and a control unit, 10, which connects to all major units to provide overall synchronization and operational control.

FIG. 3 is a detailed block diagram showing one preferred embodiment wherein images captured by image capturing unit, 40, are fed into a persistent storage, 30, which has a limited storage capacity made up of N numbers of individual storage cells, 100a, 100b and so on. The captured images are to be stored into each cell in a first-in-first-out fashion such that at any given time, a fixed number of images are to be buffered up representing the consecutive frames of actual scene. With such an arrangement, the latest images captured will replace the earliest images when the last storage cell is reached until such time when the control unit, 10, stops

1 any further images to be inserted into a cell so that the buffered images can be
2 persistently preserved. The number of consecutive images to be preserved is a
3 function of the number of storage cell N. This mechanism is designed to overcome
4 the storage problem associated with the fact that an incident can occur at any time
5 within an unlimited time span, therefore it is essential to have an economical way to
6 selectively preserve only valuable data.

7 Fig. 4 is another preferred embodiment wherein the captured images are to be
8 first inserted into a volatile memory, 20, and from which the data are then pull into
9 the persistent storage, 30, controlled by the control unit, 10.

10 It is to be noted that in addition to holding captured images, the persistent
11 storage, 30, along with the storage mechanism as shown in Fig 3 and 4, can be used
12 to hold digital sound wave captured by the audio unit, 60. Furthermore, the persistent
13 storage, 30, can be used to hold computer executable instructions and thus replaces or
14 eliminates the memory unit, 20, if so chosen. It is worth to point out that persistent
15 storage, 30, may be substituted by other forms of persistent storage media to achieve
16 a similar result even though most of such persistent storage media tend to have a
17 slower performance. Moreover, the persistent storage, 30, can also be achieved or
18 simulated by contineously powering up a volatile memory so as to retain its contains.
19 Likewise, the control unit, 10, can be selected from the group consisting of a micro-
20 processor, a micro-controller, a DSP, a PAL, an EPLD, a FPGA and other forms of
21 programmable logic circuits to provide the necessary control functionality.

22 Although the foregoing disclosure relates to preferred embodiments of the
23 invention, it is understood that these details have been given for the purposes of
24 clarification only. Various changes and modifications of the invention will be apparent,
25 to one having ordinary skill in the art, without departing from the spirit of the invention
26 as hereinafter set forth in the claims.

CLAIMS

What is claimed is:

1. A digital incident recording apparatus comprising:
 - means for continuously capturing actual visual scene that comes within the vicinity of said apparatus wherein said means for capturing visual scene is achieved by an image capturing unit,
 - means for buffering up a plurality of captured visual scene having finite number of storage elements over-written repeatedly using a first-in-first-out mechanism such that a finite storage can be used to hold a plurality of said visual scene continuously;
 - means for preserving said buffered scenes long enough to be useful after an incident has occurred;
 - means for triggering a preservation of said buffered scenes, wherein said triggering is a mechanism chosen from the group consisting of software mechanism, firmware mechanism, hardware mechanism and combinations thereof, wherein said firmware or software mechanism comprises of programmable logic instructions that fire off a signal in responding to an external event, wherein said hardware mechanism comprises at least one sensor capable of sending out a signal upon detecting a physical event, wherein said physical event can be a physical impact, sudden change in momentum, shock wave, sudden change in sound wave amplitude, manual activation and combinations thereof; and
 - means for providing overall operational control of said apparatus.
2. A digital incident recording apparatus as recited in claim 1 further comprises means for temporally storage using a volatile memory device.
3. A digital incident recording apparatus as recited in claim 1 further comprises means to draw power from a power source to provide continued operation,

wherein said power source is chosen from the group consisting of a battery, a dc power supply, an ac power supply and a combination thereof.

4. A digital incident recording apparatus as recited in claim 1 wherein said means for preserving buffered scenes comprises of a persistent storage unit chosen from the group consisting of a persistent memory device, a volatile memory device having a continued power supply so as to retain its contents, a non-memory persistent storage media and a combination thereof.
5. A digital incident recording apparatus as recited in claim 4 wherein said means for buffering up said captured scenes is achieved by feeding said captured scenes into said persistent storage unit.
6. A digital incident recording apparatus as recited in claim 2 wherein said means for buffering up said captured scenes is achieved by feeding said captured scenes into said volatile memory unit.
7. A digital incident recording apparatus as recited in claim 1 further comprises:
additional said image capturing unit that captures scenes of side and back views to include activities of the operator when said apparatus is to be used inside a transportation system.
8. A digital incident recording apparatus as recited in claim 1 further comprises:
additional said image capturing unit that captures scenes of side and back views, wherein said additional unit has its own separate said means for buffering up said captured scenes and means for preserving said buffered scenes.
9. A digital accident recording apparatus as recited in claim 1 wherein said image capturing unit is used to capture scenes of forward view as well as backward view to include the activities of said operator.

10. A digital incident recording apparatus as recited in claim 1 further comprises means for manually triggering said preservation of captured scenes, wherein said manually triggering can be an action selected from the group consisting of taking snap shots of visual scene, taking a sequence of continuous images of visual scene, and freezing the activity of said continuously capturing visual scene so as to prevent existing said scenes in said buffer of being replaced by new scenes in order to preserve existing said scenes.
11. A digital incident recording apparatus as recited in claim 1 further comprises a housing means to protect said persistent storage from being destroyed by environmental factor, wherein said factor includes temperature, impact, shaking, electrical shock and moisture.
12. A digital incident recording apparatus as recited in claim 1 further comprises means for capturing sound wave in synchronization with the said captured visual scene;
means for buffering said captured sound wave using said first-in-first-out mechanism in the same manner as for said visual scene; and
means for preserving said buffered sound wave in the same manner as for said visual scene.
13. A digital incident recording apparatus as recited in claim 11 further comprises an installation means which allows said apparatus to be taken out of an installation base and to be used as a recording apparatus outside of a transportation system, wherein said installation means is selected from the group consisting of attaching said apparatus onto a surface and inserting said apparatus into a housing unit large enough to hold said apparatus.

- 1 14. A digital incident recording apparatus as recited in claim 11 further comprises
2 an installation means which allows the said apparatus to be taken out
3 of an installation base and to be used as a hand-held recording apparatus,
4 wherein said installation means is selected from the group consisting of
5 attaching said apparatus onto a surface and inserting said apparatus into a
6 housing unit large enough to hold said apparatus.
7
- 8 15. A digital incident recording apparatus as recited in claim 1 wherein said
9 means for overall operational control comprises of a control unit chosen from
10 the group consisting of a micro-processor, a micro-controller, a DSP, a PAL,
11 an EPLD, a FPGA and a programmable logic circuit.
12
- 13 16. A method for digitally recording incidents using a finite storage for capturing
14 events that may occur at any time within a long time span comprises steps of:
15 continuously capturing the actual visual scene in real-time and
16 converting said scene into digital form;
17 controlling the operation and timing of said capture process;
18 continuously buffering up a plurality of captured images using a first-
19 in-first-out mechanism so that said buffered images can be preserved when
20 needed; and
21 triggering a permanent preservation of a plurality of frames of
22 said buffered images.
23
- 24 17. A method for digitally recording incidents as recited in claim 16 wherein
25 said permanent preservation of a plurality of frames of visual scenes is
26 achieved by prohibiting older said images from being erased and replaced by
27 newer images such that said plurality of frames stored are composed of a
28 number of images captured so many seconds before, during and after said
29 triggering.
30

1 18. A method for digitally recording incident as recited in claim 16 further
2 comprises the step of:

3 detecting an external event so as to generate said triggering, wherein
4 said event is chosen from the group consisting of physical impact, sudden
5 change of momentum, sudden change of sound amplitude, manual activation,
6 unusual occurrence of objects in said captured images, distance between
7 said objects, movement of said objects and a combination thereof.

8
9 19. A method for digitally recording incidents as recited in claim 16 further
10 comprises the step of:

11 capturing rear and side view scenes to include the activities of the
12 operator of a transportation system;

13 buffering said rear and side view scenes using said first-in-first-out
14 mechanism; and

15 preserving said buffered images when said triggering occurs.

16 20. A method for digitally recording incidents as recited in claim 16 further
17 comprises the step of:

18 capturing surrounding sound wave corresponding to said visual
19 scene;

20 buffering said captured sound wave using said first-in-first-out
21 mechanism in the same manner as for said visual scenes; and

22 preserving said buffered sound wave when said triggering occurs.
23
24
25
26

ABSTRACT

A method and apparatus for capturing the visual scenes of an incident so many seconds before, during and after the incident has occurred is disclosed. The apparatus can provide additional functionality of capturing the activities of the operator of a transportation system as well as the sound wave of the environment before, during and after an incident. The disclosed method and apparatus can be used in a land, sea and air based transportation system as well as a traffic monitoring system. The apparatus uses a digital first-in-first-out buffering mechanism to allow for capturing of an event that may occur at any time in an infinite time span using a finite storage. The apparatus is comprised of a control unit for overall operational control, a memory unit for temporally storage, an imaging capturing unit for capturing visual scene, a digital sensor for triggering an automatic preservation of captured scenes, a digital sound recorder for capturing sound wave matching the recorded images, a persistent storage unit for preserving of captured scene and sound wave, a power source to allow for continued operation and a protective housing to resist environmental damages.

FIG. 1 is a schematic diagram of a device 100. The device 100 includes a housing 10, a display 20, a camera 30, a microphone 40, a speaker 50, a battery 60, and a processor 70. The housing 10 is a rectangular frame. The display 20 is a rectangular area on the left side of the housing 10. The camera 30 is a small square on the top edge of the housing 10. The microphone 40 is a small square on the top edge of the housing 10, to the right of the camera 30. The speaker 50 is a small square on the top edge of the housing 10, to the right of the microphone 40. The battery 60 is a small square on the right edge of the housing 10. The processor 70 is a small square on the bottom edge of the housing 10. The device 100 is shown in a perspective view.

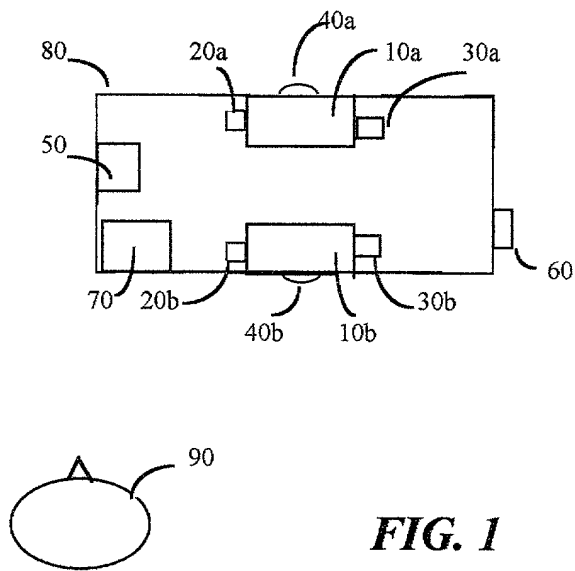


FIG. 1

FIG. 2 is a block diagram of a system 10. The system 10 includes a control unit 10, a RAM 20, a persistent storage 30, a sensor 50, and an audio unit 60. The control unit 10 is connected to the RAM 20, the persistent storage 30, the sensor 50, and the audio unit 60. The RAM 20 is connected to the persistent storage 30. The sensor 50 is connected to the audio unit 60. The audio unit 60 is connected to a speaker 40.

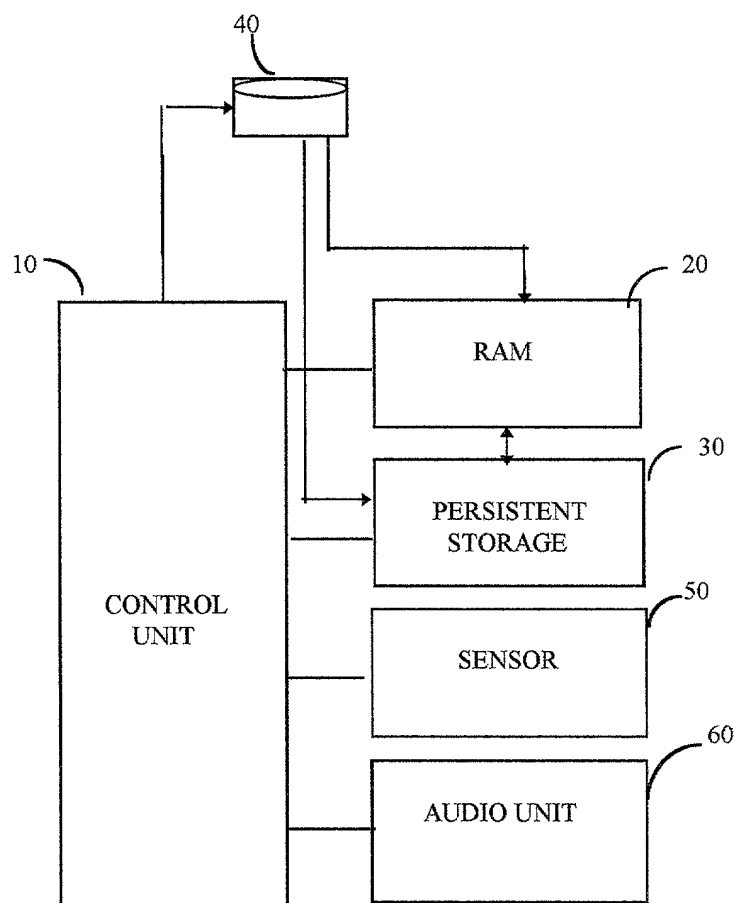


FIG. 2

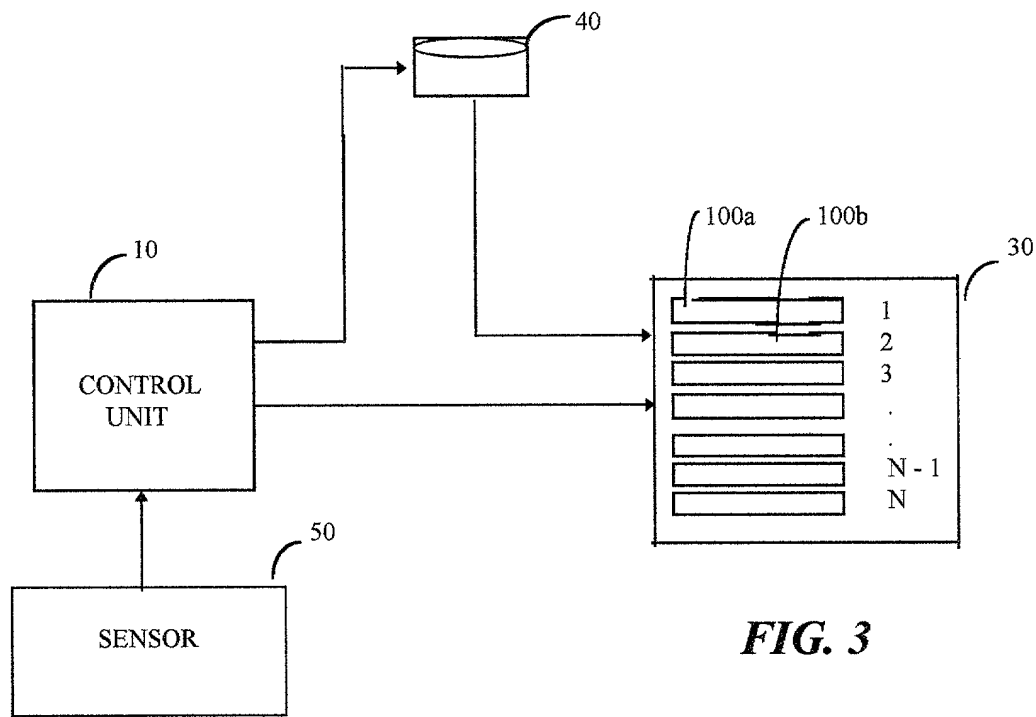


FIG. 3

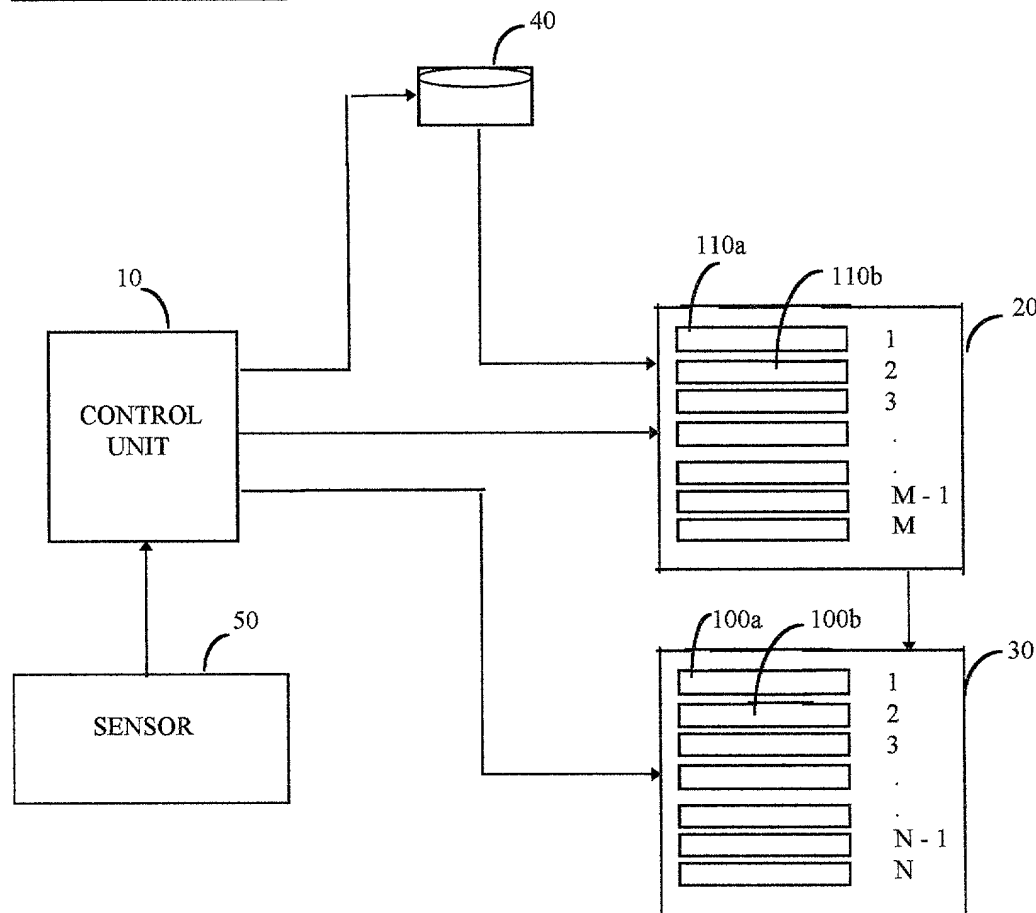


FIG. 4

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Class-Subclass:

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DECLARATION FOR UTILITY PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence and mailing address are as stated below, along with my citizenship.

I believe I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention, the specification of which is enclosed and which has the following title: Method and Apparatus for Recording Incidents.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims. I acknowledge a duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby declare that all the statements made herein of my own knowledge are true and that all statements made on information and believe are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18,

[illegible]

Date: July 7, 1999

Residence: 715 Paris Drive,
Lawrenceville, GA 30243

Mailing Address: 12779 Fair Briar Lane
Fairfax, VA 22033

Citizenship: Citizen of the United States